McGuireWoods LLP
1750 Tysons Boulevard
Suite 1800
McLean, VA 22102-4215
Phone: 703.712.5000
Fax: 703.712.5050
www.mcguirewoods.com

Hae-Chan Park
Direct: 703.712.5365

McGUIREWOODS

hpark@mcguirewoods.com
Direct Fax: 703.712.5280

April 12, 2004

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Re: U.S. Utility Patent Application
U.S. Patent No. 6,710,837 B1, issued on March 23, 2004
Application No. 09/311,718
Filed: May 14, 1999
LIQUID CRYSTAL DISPLAYS HAVING MULTI-DOMAINS AND A MANUFACTURING METHOD THEREOF
Inventors: Jang-Kun SONG, *et al.*
Our Ref: 6192.0085.AA

Sir:

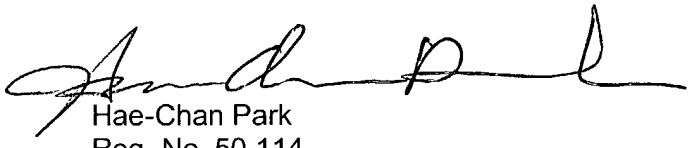
The following documents are forwarded herewith for appropriate action by the U.S. Patent and Trademark Office:

1. Request for Certificate of Correction;
2. Certificate of Correction Form PTO 1050 indicating the requested corrections;
3. A marked-up copy of the Letters Patent indicating the requested corrections in red ink;
4. A copy of the Examiner's Form PTO-892, Notice of References Cited, mailed on July 7, 2003, as part of Paper No. 17;
5. A copy of the Abstract, filed with the U.S. Patent and Trademark Office on May 14, 1999, and a copy of the date-stamped postcard evidencing the filing of the same;
6. A copy of the Reply and Amendment Under 37 C.F.R. § 1.116, filed with the U.S. Patent and Trademark Office on September 24, 2003, and a copy of the date-stamped postcard evidencing the filing of the same; and
7. One acknowledgement postcard.

It is respectfully requested that the attached copy of the postcard be stamped with the filing date of these documents and returned to our courier.

The U.S. Patent and Trademark Office is hereby authorized to charge any fee deficiency, or credit any overpayment, to our Deposit Account No. 23-1951 referencing docket number 6192.0085.AA.

Respectfully submitted,



Hae-Chan Park
Reg. No. 50,114

HCP/bjb
Enclosures

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patentees: Jang-Kun SONG, *et al.* Issued: March 23, 2004

Patent No.: 6,710,837 B1

For: **LIQUID CRYSTAL DISPLAYS HAVING MULTI-DOMAINS AND A MANUFACTURING METHOD THEREOF**

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

REQUEST FOR CERTIFICATE OF CORRECTION UNDER 37 C.F.R. 1.322 OFFICE MISTAKE

Sir:

Transmitted herewith in duplicate is PTO Form 1050 - Certificate of Correction for the above-identified U.S. Patent correcting the Office mistakes as shown in the enclosed Certificate of Correction form. The corrections for the Office mistakes are reflected in the attached copy of the Examiner's Form PTO-892, Notice of References Cited, mailed on July 7, 2003, as part of Paper No. 17; in the attached copy of the Abstract, filed with the U.S. Patent and Trademark Office on May 14, 1999; and in the attached copy of the Reply and Amendment Under 37 C.F.R. § 1.116, filed on September 24, 2003. Also attached is a copy of the date-stamped postcard evidencing the filing of the Abstract with the U.S. Patent and Trademark Office on May 14, 1999; as well as a copy of the date-stamped postcard evidencing the filing of the Reply and Amendment with the U.S. Patent and Trademark Office on September 24, 2003.

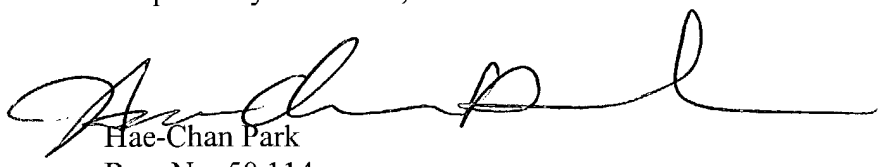
Also enclosed is a copy of the Letters Patent, with the requested corrections marked in red ink.

Since the above-mentioned matters were correctly shown in the Examiner's Notice of References Cited, in the Abstract and in the Reply and Amendment, issuance of

a Certificate of Correction is in order. Since these errors were due to the Patent and Trademark Office, no fee is submitted herewith.

If any error is determined to be on part of the applicants, please charge all necessary fees to attorney's deposit account no. 23-1951.

Respectfully submitted,



Hae-Chan Park
Reg. No. 50,114

Date: April 12, 2004

McGuireWoods LLP
1750 Tysons Boulevard, Suite 1800
McLean, VA 22102
(703) 712-5000

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO.: 6,710,837 B1
DATED: March 23, 2004
INVENTORS: Jang-Kun SONG, *et al.*

It is certified that errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below.

On the Title Page, Item [56], References Cited, U.S. Patent Documents:
Insert --6,407,794 A * 6/2002 Koma ..... 349/141--.

On the Title Page, Item [57], Abstract,
Line 16, Change "surface" to --surfaces--.

Column 13,
Line 23, Change "other" to --outer--.

MAILING ADDRESS OF SENDER:

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(703) 712-5000

PATENT NO.: 6,710,837 B1
No. of add'l copies
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FORM **PTO 1050** (Rev. 2-93)

19 APR 2004

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO.: 6,710,837 B1
DATED: March 23, 2004
INVENTORS: Jang-Kun SONG, *et al.*

It is certified that errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below.

On the Title Page, Item [56], References Cited, U.S. Patent Documents:
Insert --6,407,794 A * 6/2002 Koma ..... 349/141--.

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PATENT NO.: 6,710,837 B1
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FORM PTO 1050 (Rev. 2-93)

19 APR 2004

US006710837B1

(12) **United States Patent**
Song et al.

(10) **Patent No.: US 6,710,837 B1**
(45) **Date of Patent: Mar. 23, 2004**

(54) **LIQUID CRYSTAL DISPLAYS HAVING MULTI-DOMAINS AND A MANUFACTURING METHOD THEREOF**

(75) Inventors: **Jang-Kun Song**, Seoul (KR); **Seung-Beom Park**, Kyungki-do (KR); **Byoung-Sun Na**, Kyungki-do (KR)

(73) Assignee: **Samsung Electronics Co., Ltd.**, Suwon (KR)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/311,718**

(22) Filed: **May 14, 1999**

(30) **Foreign Application Priority Data**

May 16, 1998 (KR) 98-17734

(51) **Int. Cl.**[7] **G02F 1/1343**; G02F 1/1337
(52) **U.S. Cl.** **349/143**; 349/130
(58) **Field of Search** 349/130, 143

(56) **References Cited**

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KR	1992-1949	9/1993	..... G02F/1/343

* cited by examiner

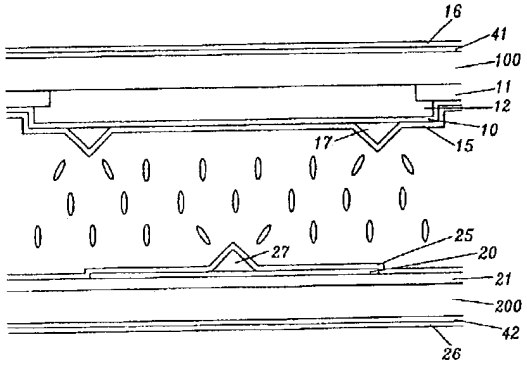
Primary Examiner—Dung Nguyen
(74) *Attorney, Agent, or Firm*—McGuireWoods LLP

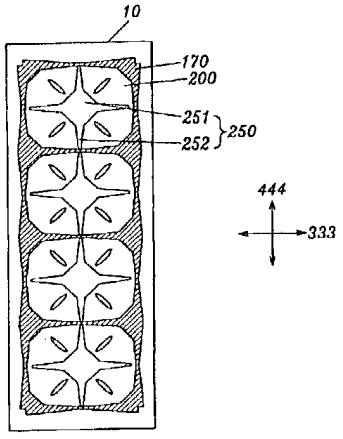
(57) **ABSTRACT**

A black matrix and a color filter are formed on a substrate, a indium-tin-oxide (ITO) common electrode are deposited thereon and then protrusion pattern made of sensitive material such as photoresist are formed on the common electrode with 3 to 20 micron width. A vertical alignment layer is coated thereon to complete a color filter substrate. After a thin film transistor (TFT) and a passivation film are formed on the other substrate, ITO is deposited on the passivation film and patterned to form a pixel electrode which contains open areas with 3 to 20 micron width. Then, a vertical alignment layer is coated to complete a TFT substrate. Two substrates are assembled in the manner that the apertures and the protrusion patterns are arranged on shifts and liquid crystal having negative dielectric anisotropy is injected between the substrates. Each Polarizer is attached at the outer ~~surface~~ surfaces of the LCD substrates. Compensation films may be attached between the polarizer and the substrate.

36 Claims, 21 Drawing Sheets

6,407,794 A * 6/2002 Koma 349/141





2. The liquid crystal display of claim 1, wherein the width of the first branch decreases as advancing from the protrusion to an end of the first branch.

3. The liquid crystal display of claim 2, wherein the protrusion has a second branch extending from a convex point of the protrusion toward the aperture, and

the aperture has an extension extending from a convex point of the aperture toward the protrusion.

4. The liquid crystal display of claim 3, wherein the width of the extension decreases as advancing toward an end of the extension, and

the width of the second branch decreases as advancing toward the edge of the pixel electrode.

5. A liquid crystal display, comprising:

a first substrate;

a common electrode formed on the first substrate;

a plurality of protrusions formed on the common electrode;

a second substrate facing the first substrate;

a pixel electrode having a plurality of apertures and formed on the second substrate; and

first and second polarizers attached to ~~other~~ outer surfaces of the first and second substrates respectively, polarizing directions of the first and second polarizers being perpendicular to each other,

wherein the aperture has a shape of cross including first and second portions crossing each other at a right angle, and

the shape of the protrusion is tetragonal surrounding the aperture.

6. The liquid crystal display of claim 5, wherein the width of the aperture decreases as advancing from a center of the aperture to ends of the aperture.

7. The liquid crystal display of claim 6, wherein the center of the cross is diamond-shaped.

8. The liquid crystal display of claim 7, wherein the distance between the apertures is 10 to 50 microns.

9. The liquid crystal display of claim 5, wherein the protrusion is located substantially outside edges of the pixel electrode.

10. The liquid crystal display of claim 5, wherein a portion of the protrusion overlaps edges of the pixel electrode.

11. A liquid crystal display, comprising:

a first substrate;

a common electrode formed on the first substrate;

a plurality of protrusions formed on the common electrode;

a second substrate facing the first substrate;

a pixel electrode having a plurality of apertures and formed on the second substrate; and

first and second polarizers attached to outer surfaces of the first and second substrates, respectively, polarizing directions of the first and second polarizers being perpendicular to each other,

wherein the aperture has an X shape including first and second portions crossing each other at a right angle, and

the protrusion surrounds the X shaped aperture.

12. The liquid crystal display of claim 11, wherein the first and second portions are parallel to the polarizing axes of the first and second polarizers, respectively.

13. A liquid crystal display, comprising:

a first substrate;

a common electrode formed on the first substrate;

a plurality of protrusions formed on the common electrode;

a second substrate facing the first substrate;

a pixel electrode having a plurality of apertures and formed on the second substrate; and

first and second polarizers attached to outer surfaces of the first and second substrates, respectively, polarizing directions of the first and second polarizers being perpendicular to each other,

wherein the aperture has an X shape including first and second portions crossing each other at a right angle, and

the protrusion is located substantially outside edges of the pixel electrode.

14. A liquid crystal display, comprising:

a first substrate;

a common electrode formed on the first substrate;

a plurality of protrusions formed on the common electrode;

a second substrate facing the first substrate;

a pixel electrode having a plurality of apertures and formed on the second substrate; and

first and second polarizers attached to outer surfaces of the first and second substrates respectively, polarizing directions of the first and second polarizers being perpendicular to each other,

wherein the aperture has an X shape including first and second portions crossing each other at a right angle, and

a portion of the protrusion overlaps edges of the pixel electrode.

15. A liquid crystal display comprising:

a first substrate including a pixel electrode having at least a wedge-shaped aperture;

a second substrate facing the first substrate and including a common electrode and at least a wedge-shaped protrusion on the common electrode, the protrusion being parallel and alternate to the aperture; and

a black matrix on the second substrate, the black matrix including a first portion overlapping the protrusion, a second portion passing through bent points of the protrusion the aperture and a third portion covering a region where the protrusion and the aperture meet a boundary of the pixel electrode.

16. The liquid crystal display of claim 15, wherein the black matrix further includes a fourth portion overlapping the protrusion.

17. The liquid crystal display of claim 15, wherein the third portion of the black matrix is triangular.

18. A liquid crystal display, comprising:

a first substrate having a plurality of pixel electrodes including a first electrode;

a second substrate facing the first substrate and including a second electrode; and

a plurality of protrusions provided on at least one of the first and second substrates, the plurality of protrusions including first and second protrusions having shapes of substantially straight lines,

wherein either the first and second protrusions or imaginary extensions of the first and second protrusions meet each other.

19. The liquid crystal display of claim 18, wherein the first and second protrusions are located substantially in an area corresponding to the first pixel electrode.

20. The liquid crystal display of claim 19, wherein the first and second protrusions are oblique to edges of the first pixel electrode.

UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/311,718	05/14/1999	JANG-KUN SONG	06192.0085	1612

22930 7590 07/07/2003

HOWREY SIMON ARNOLD & WHITE LLP
BOX 34
1299 PENNSYLVANIA AVENUE NW
WASHINGTON, DC 20004

EXAMINER
NGUYEN, DUNG T

ART UNIT	PAPER NUMBER
2871	

DATE MAILED: 07/07/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.	Applicant(s)
09/311,718	Song et al.
Examiner	**Art Unit**
Dung Nguyen	2871

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on *Apr 17, 2003* .

2a) ☒ This action is **FINAL.** 2b) ☐ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) *1-77* is/are pending in the application.

4a) Of the above, claim(s) _____ is/are withdrawn from consideration.

5) ☒ Claim(s) *13-16, 23-26, 28, 29, 31-34, 41-43, and 59-77* is/are allowed.

6) ☒ Claim(s) *1-12, 17-22, 27, 30, 35-40, and 44-58* is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on _____ is/are a) ☐ accepted or b) ☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13) ☒ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a) ☒ All b) ☐ Some* c) ☐ None of:

1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

*See the attached detailed Office action for a list of the certified copies not received.

14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

a) ☐ The translation of the foreign language provisional application has been received.

15) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s). _____
4) ☐ Interview Summary (PTO-413) Paper No(s). _____
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

19 APR 2004

Notice of References Cited

Application/Control No.	Applicant(s)/Patent Under Reexam	
09/311,718	Song et al.	
Examiner: Dung Nguyen	Art Unit: 2871	Page 1 of 1

U.S. PATENT DOCUMENTS

		Document Number Country Code-Number-Kind Code	Date MM-YYYY[1]	Name	Classification[2]	
	A	6,407,794	6/2002	Koma	349	141
	B					
	C					
	D					
	E					
	F					
	G					
	H					
	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

		Document Number Country Code-Number-Kind Code	Date MM-YYYY[1]	Country	Name	Classification[2]	
	N						
	O						
	P						
	Q						
	R						
	S						
	T						

NON-PATENT DOCUMENTS

		Include, as applicable: Author, Title, Date, Publisher, Edition or Volume, Pertinent Pages
	U	
	V	
	W	
	X	

* A copy of this reference is not being furnished with this Office action. See MPEP § 707.05(a). [1] Dates in MM-YYYY format are publication dates. [2] Classifications may be U.S. or foreign.

US006407794B2

(12) **United States Patent**
Koma

(10) **Patent No.: US 6,407,794 B2**
(45) **Date of Patent: *Jun. 18, 2002**

(54) **VERTICALLY ALIGNED TYPE LIQUID CRYSTAL DISPLAY**

(75) Inventor: **Norio Koma**, Gifu (JP)

(73) Assignee: **Sanyo Electric Co., Ltd.**, Osaka (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **09/768,371**

(22) Filed: **Jan. 23, 2001**

Related U.S. Application Data

(62) Division of application No. 09/162,984, filed on Sep. 29, 1998.

(30) **Foreign Application Priority Data**

Oct. 1, 1997 (JP) 9-268973

(51) **Int. Cl.**[7] **G02F 1/1343**

(52) **U.S. Cl.** **349/141**; 349/142; 349/144; 349/146

(58) **Field of Search** 349/141, 142, 349/139, 146, 144

(56) **References Cited**

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JP	6194657	7/1994
JP	61944656	7/1994

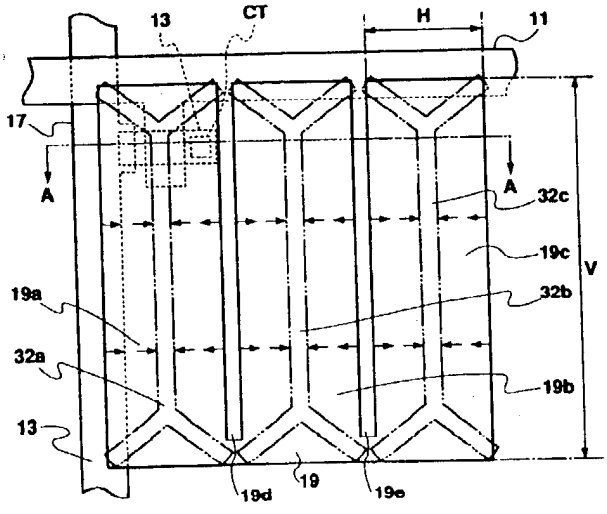
* cited by examiner

Primary Examiner—William I. Sikes
Assistant Examiner—Julie Ngo
(74) *Attorney, Agent, or Firm*—Hogan & Hartson, L.L.P.

(57) **ABSTRACT**

A vertically aligned type liquid crystal display includes a liquid crystal layer disposed between a pixel electrode and a common electrode and containing vertically aligned liquid crystal molecules, the orientation of the liquid crystal molecules being controlled by electric field. An orientation control window is formed in the common electrode located opposite to the pixel electrode and an aspect ration, i.e., a vertical to horizontal length ratio of the pixel electrode is set to at least 2. Alternatively, the pixel electrode is partitioned into at least two electrode regions that each region represents a divided pixel electrode. An orientation control window is formed in the common electrode so as to correspond to each divided pixel electrode, an aspect ratio of each divided pixel electrode is set to at least 2. As such, the influence at the edge sections of the pixel electrode is reduced, viewing angle characteristic and transmittance are improved, and average response time is shortened.

16 Claims, 7 Drawing Sheets



Inventors:	Jang-Kun SONG, Seung-Beom PARK and Byoung-Sun NA	Date:	May 14, 1999
Serial No.:	To Be Assigned	Group Art.:	
Filing Date:	May 14, 1999	Examiner:	To Be Assigned
For:	Liquid Crystal Displays Having Multi-Domains And A Manufacturing Method Thereof	Atty. Docket:	06192.0085

BOX PATENT APPLICATION

Assistant Commissioner of Patents and Trademarks:

Please place the Patent Office receipt stamp hereon to acknowledge receipt of the following:

1. Utility Patent Application Transmittal Letter (duplicate);
2. Utility Patent Application Transmittal Form SB/05;
3. Fee Transmittal Form 1082 (duplicate);
4. Application consisting of **27** pages of spec. (pages 1-27); **7** pages of claims (pages 28-34); **1** page of Abstract (page 35); **21** sheets of informal drawings (Figs. 1A, 1B, 2, 3A, 3B, 4A, 4B, 5, 6, 7, 8A, 8B, 9 - 18, 19A – E, and 20A - D);
5. Howrey & Simon Check No. 309850 in the amount of $1,396.00;
6. two (2) return postcards.

Michael J. Bell
Registration No. 39,604

ABSTRACT OF THE DISCLOSURE

A black matrix and a color filter are formed on a substrate, a indium-tin-oxide (ITO) common electrode are deposited thereon and then protrusion pattern made of sensitive material such as photoresist are formed on the common electrode with 3 to 20 micron width. A vertical alignment layer is coated thereon to complete a color filter substrate. After a thin film transistor (TFT) and a passivation film are formed on the other substrate, ITO is deposited on the passivation film and patterned to form a pixel electrode which contains open areas with 3 to 20 micron width. Then, a vertical alignment layer is coated to complete a TFT substrate. Two substrates are assembled in the manner that the apertures and the protrusion patterns are arranged on shifts and liquid crystal having negative dielectric anisotropy is injected between the substrates. Each Polarizer is attached at the outer surfaces of the LCD substrates. Compensation films may be attached between the polarizer and the substrate.

Inventors:	Jang-Kun SONG, et al.	Date:	September 24, 2003
Serial No.:	09/311,718	Group Art.:	2871
Filing Date:	May 14, 1999	Examiner:	NGUYEN, Dung T.
For:	LIQUID CRYSTAL DISPLAYS HAVING MULTI-DOMAINS AND A MANUFACTURING METHOD THEREOF	Atty. Docket:	6192.0085.AA

Commissioner for Patents:

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1. A Transmittal Letter;
2. A Reply and Amendment Under 37 C.F.R. §1.116; and
3. Two Acknowledgement postcards.

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Hae-Chan Park
Registration No. 50,114

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Inventors:	Jang-Kun SONG, et al.	Date:	September 24, 2003
Serial No.:	09/311,718	Group Art.:	2871
Filing Date:	May 14, 1999	Examiner:	NGUYEN, Dung T.
For:	LIQUID CRYSTAL DISPLAYS HAVING MULTI-DOMAINS AND A MANUFACTURING METHOD THEREOF	Atty. Docket:	6192.0085.AA

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PATENT & TRADEMARK OFFICE

Hae-Chan Park
Registration No. 50,114

HAND DELIVERED

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Inventors:	Jang-Kun SONG, et al.	Date:	September 24, 2003
Serial No.:	09/311,718	Group Art.:	2871
Filing Date:	May 14, 1999	Examiner:	NGUYEN, Dung T.
For:	LIQUID CRYSTAL DISPLAYS HAVING MULTI-DOMAINS AND A MANUFACTURING METHOD THEREOF	Atty. Docket:	6192.0085.AA

Commissioner for Patents:

Please place the Patent Office receipt stamp hereon to acknowledge receipt of the following:

1. A Transmittal Letter;
2. A Reply and Amendment Under 37 C.F.R. §1.116; and
3. Two Acknowledgement postcards.

Hae-Chan Park
Registration No. 50,114

RESPONSE UNDER 37 C.F.R. §1.116
---EXPEDITE PROCEDURE---
GROUP ART UNIT 2871

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re patent application of	Docket No.: 6192.0085.AA
Jang-Kun SONG, *et al.*	
Serial No.: 09/311,718	Group Art Unit: 2871
Confirmation No.: 1612	
Filed: May 14, 1999	Examiner: NGUYEN, Dung T.

For: **LIQUID CRYSTAL DISPLAYS HAVING MULTI-DOMAINS AND A MANUFACTURING METHOD THEREOF**

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

REPLY AND AMENDMENT UNDER 37 C.F.R. § 1.116

Sir:

In response to the Office Action mailed on July 7, 2003, Applicants submit the following Amendments and Remarks.

It is not believed that any extensions of time or fees for net addition of claims are required at this moment. However, if additional extensions of time are necessary to prevent abandonment of this application, then such extensions of time are hereby petitioned under 37 C.F.R. §1.136(a), and any fees required therefor (including fees for net addition of claims) are hereby authorized to be charged to our Deposit Account No. 23-1951. Please credit any overpayment to deposit Account No. 23-1951.

CLAIM AMENDMENT

Please **CANCEL** claims 1-12, 17-22, 27, 30, 35-40 and 44-58 without prejudice or disclaimer.

Please **AMEND** claims 13-16, 23, 24, 31-34, 41, 59-70 and 72-77, as follows.

1-12. (Currently Cancelled)

13. (Currently Amended) A liquid crystal display, comprising:

a first substrate;

a common electrode ~~which is~~ formed on the first substrate;

a plurality of protrusions formed on the common electrode;

a second substrate facing the first substrate;

a pixel electrode having a plurality of apertures and formed on the second substrate; and

~~a~~ first and ~~a~~ second polarizers attached to outer surfaces of the first and ~~the~~ second substrates, respectively, polarizing directions of the first and ~~the~~ second polarizers being perpendicular to each other,

wherein the protrusions have symmetrical cross sections~~,~~ and have a shape of a wedge-shaped line having a width, ~~and~~

the apertures and the protrusions are arranged alternately, and

~~wherein~~ the protrusion has a first branch extending along an edge of the pixel electrode from a position at which the aperture meets the edge of the pixel electrode with an acute angle.

14. (Currently Amended) The liquid crystal display of claim 13, wherein the width of the first branch decreases as ~~goes~~ advancing from the protrusion to an end of the first branch.

15. (Currently Amended) The liquid crystal display of claim 14, wherein the protrusion has a second branch extending from a convex point of the protrusion toward the aperture~~;~~, and

the aperture has an extension extending from a convex point of the aperture toward the protrusion.

16. (Currently Amended) The liquid crystal display of claim 15, wherein the width of the extension decreases as ~~goes to~~ advancing toward an end of the extension~~;~~, and

the width of the second branch decreases as ~~goes to~~ advancing toward the edge of the pixel electrode.

17-22. (Currently Cancelled)

23. (Currently Amended) A liquid crystal display, comprising:

a first substrate;

a common electrode ~~which is~~ formed on the first substrate;

a plurality of protrusions formed on the common electrode;

a second substrate facing the first substrate;

a pixel electrode having a plurality of apertures and formed on the second substrate; and

~~a~~ first and ~~a~~ second polarizers attached to outer surfaces of the first and ~~the~~ second substrates respectively, polarizing directions of the first and ~~the~~ second polarizers being perpendicular to each other,

wherein the aperture has a shape of cross including ~~a~~ first and ~~a~~ second portions crossing each other at a right angle, and

~~wherein~~ the shape of the protrusion is ~~a tetragon~~ tetragonal surrounding the aperture.

24. (Currently Amended) The liquid crystal display of claim 23, wherein the width of the aperture decreases as ~~goes~~ advancing from a center of the aperture to ends of the aperture.

25. (Original) The liquid crystal display of claim 24, wherein the center of the cross is diamond-shaped.

26. (Original) The liquid crystal display of claim 25, wherein the distance between the apertures is 10 to 50 microns.

27. (Currently Cancelled)

28. (Original) The liquid crystal display of claim 23, wherein the protrusion is located substantially outside edges of the pixel electrode.

29. (Original) The liquid crystal display of claim 23, wherein a portion of the protrusion overlaps edges of the pixel electrode.

CONCLUSION

All of the stated grounds of objection and rejection have been properly traversed, accommodated, or rendered moot. Applicants therefore respectfully request that the Examiner reconsider all presently outstanding objections and rejections and that they be withdrawn. Applicants believe that a full and complete response has been made to the outstanding Office Action and, as such, claims 13-16, 23-26, 28, 29, 31-34, 41-43 and 59-77 are in condition for allowance. If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided.

Prompt and favorable consideration of this Amendment is respectfully requested.

Respectfully submitted,

Maryam M Ipakchi

Maryam M. Ipakchi
Reg. No. 51,835

Hae-Chan Park
Reg. No. 50,114

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McGuireWoods LLP
1750 Tysons Boulevard
Suite 1800
McLean, VA 22102-4215
Tel: 703-712-5365
Fax: 703-712-5280
HCP:WSC/kbs

\\COM\223411.1